EL5 Software Operational Manual

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Introduction

This software can running in the Windows XP, Windows Vista, Win7.The computer perform data exchange and debug with EL5 series driver by series communication. Please read the operation specification of driver when using.

1. System compose

This software adapt our company EL5 series driver, can't using the other driver.

2. Running condition

Operation system:

CPU: above 1.5GHz

RAM: above 256M

Hard disk capacity: above 10G

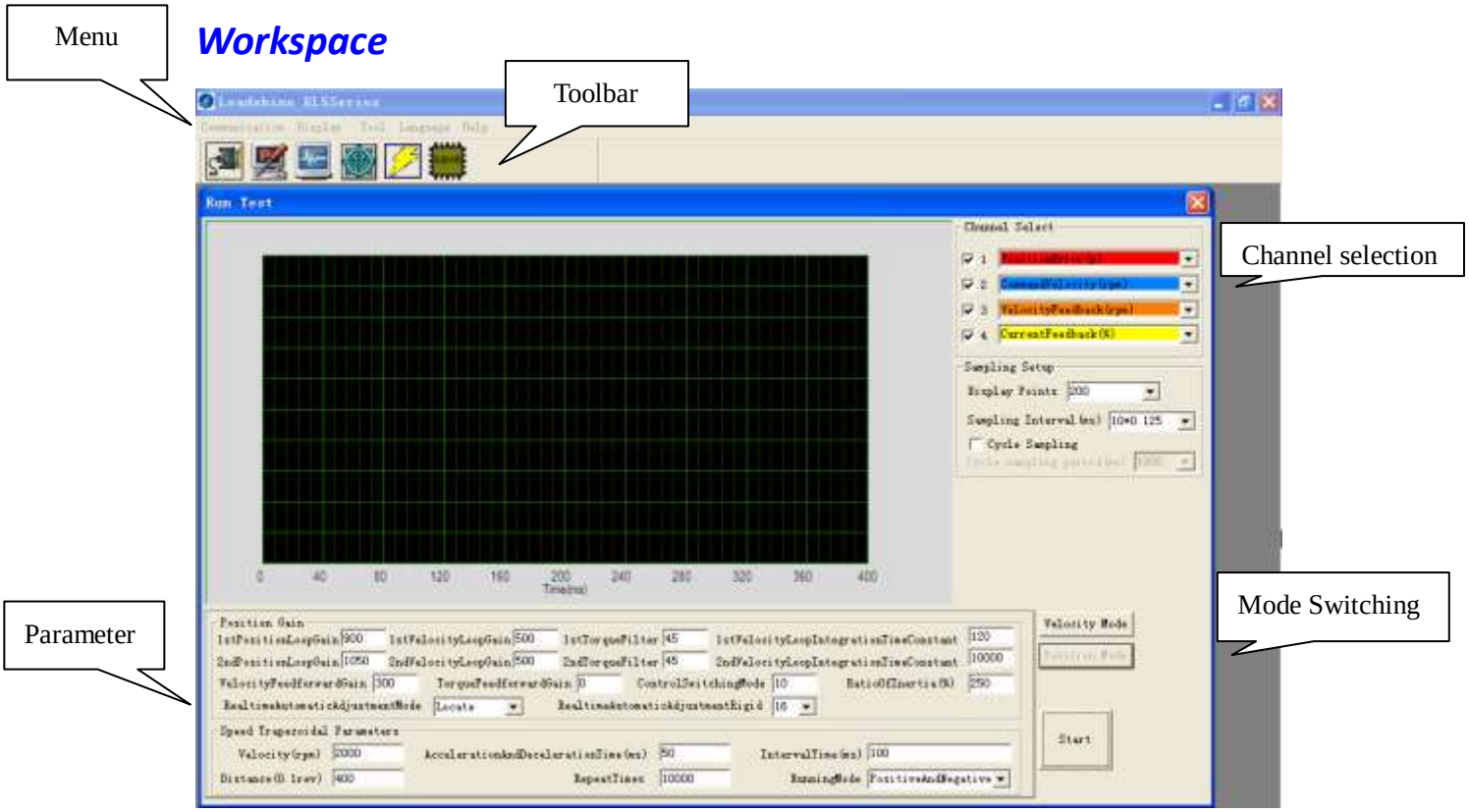
Displayer: resolution 1024*768, color 24 bit

Communication interface: normal series or USB series adapter

Note: maybe because of the update of software version, the chart has different and actual.

ProTuner for EL5-D0750 is a software tool designed to configure and tune the Leadshine digital servo drive EL5-D0750. The user can tune the velocity loop and adjust the position loop parameters in this software.

Workspace



Menus and Toolbar

Menus and toolbars are at the top of the workspace. You can click menu bar to view the pull-down menu. The toolbar below the menu offers the most frequency used commands.

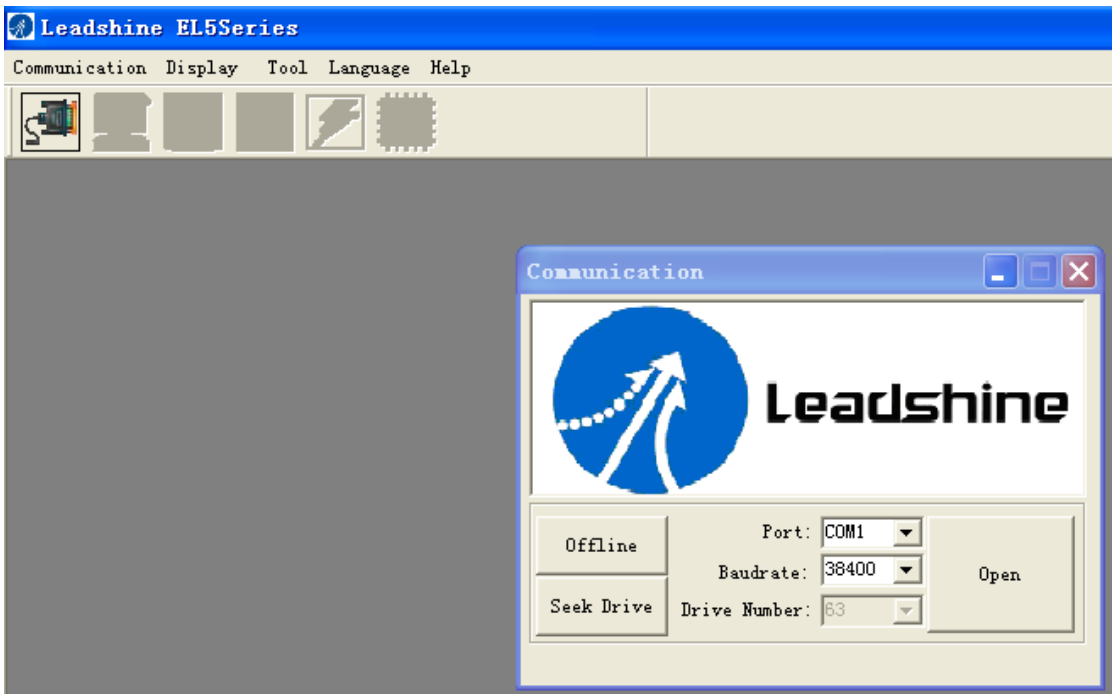
Menu	Pull Down	Toolbar	Function
Communication ->	Connect Driver		Popup communication setup dialog box, select series, match communication parameter and connect driver
	Exit		Exit operation software
Display ->	Parameter Manage		Read, display, modification driver parameter, save parameter to local disk
	Save Driver Parameter		Save driver current parameter, write parameter to using EEPROM
	Waveform Curve		Monitor driver current running state, display oscillogram; and to wave record and save
	Run Test		Run Test the driver, adjust parameter so that let driver performance the best.
	Alarm		Check and resolve of the driver current or history record
	Environment Parameter Setup		Communication delay setup
	Encoder Manage		Setup encoder each parameter
Tools->	Debug Tool		Fast set specify address parameter. convenience to professional fast setup

	Calculator		Perform each digital calculate, more often use convert between hexadecimal and decimal
Language->	Simplified Chinese		The software switching to Chinese version
	English		The software switching to English version
Help->	Operation Specification		Open operation help document
	Platform Information		Check current software, driver software version, hardware, version, motor model information.

Using the software

Connect driver

Please click the communication in menu or toolbar series communication, the communication in menu pull down: communication->connect driver, click it will appear series communication interface.



In this window, you can off-line using; setting communication Port, Baud rate, Equipment, then click the open series, enter workspace.

Off-line using

You can operation software as connect driver when no connect driver, convenience operation worker are familiar with software operation when no connect driver

Check equipment

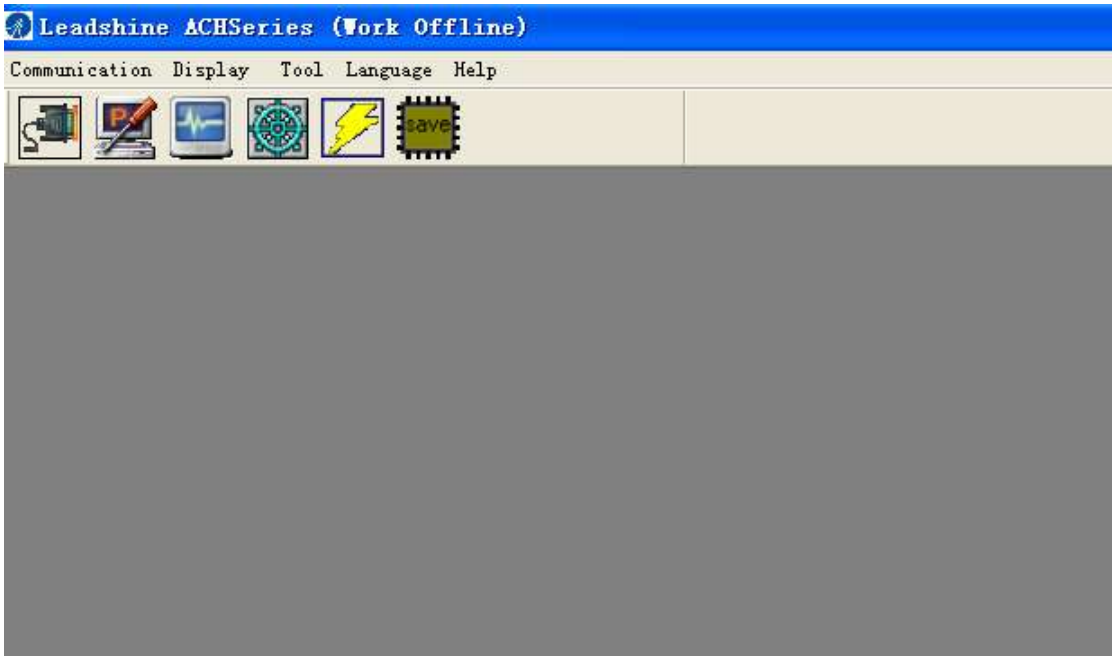
Search 0`63 range equipment when unknown driver equipment number, after search successful will change equipment number automatically. And stop search.

Notice

Before clicking on the Open button, please make sure:

1) The RS232 cable .has been connected between the drive and the PC's serial port.
2) The drive has been powered on and the green LED is on.

The motor is unnecessary connecting to the drive if you just want to change the parameters but not tuning.



Parameter Manage

Read File:

Reading parameter setup from the folder

Save As:

Make the current parameter save as parameter file format; and write note so that the other man can clearly know this parameter effect and using range after getting the parameter list

Unload:

Reading driver parameter to the computer.

Download:

Make the modification parameter of computer download to the driver.

Save:

Save driver current parameter.

Parameter Compare:

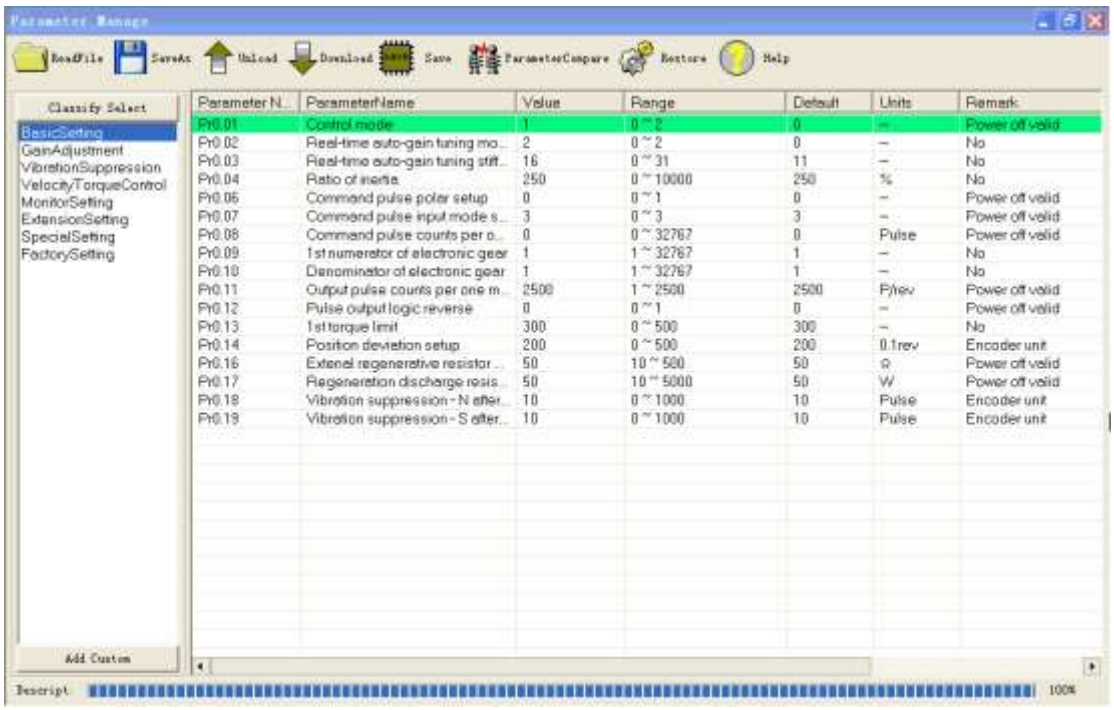
Compare the different of two sets parameter and display out.

Restore:

This operation will clear driver current parameter. Please be careful operation

Parameter classify selection:

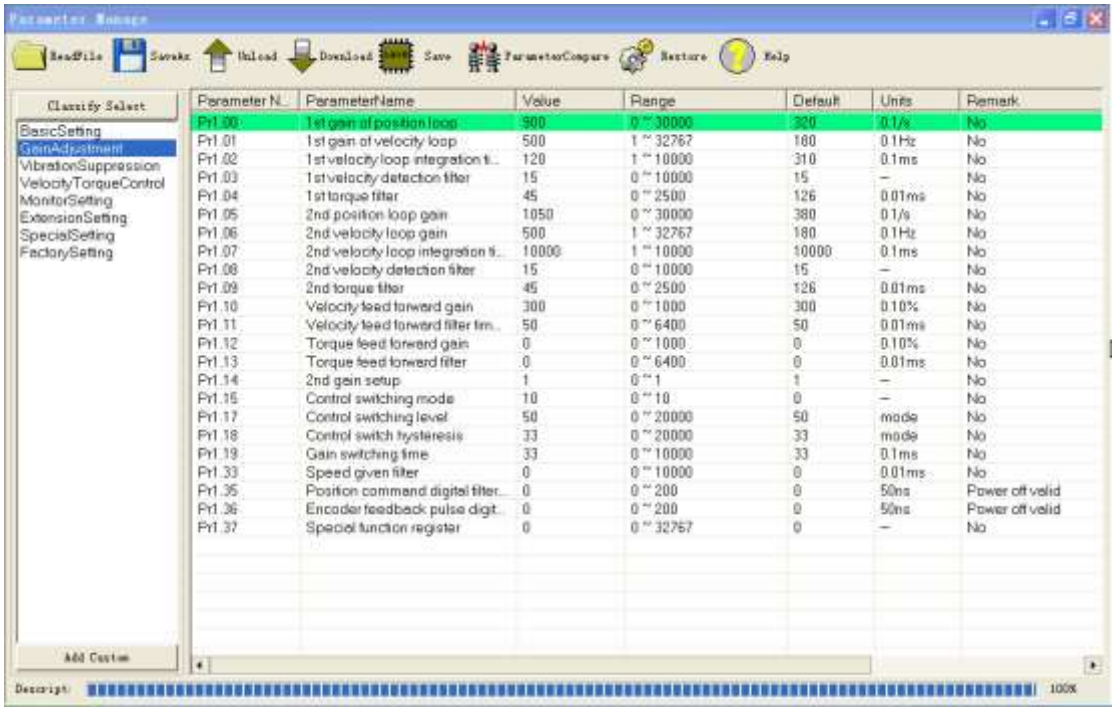
Basic setup



Parameter N..	ParameterName	Value	Range	Default	Units	Remark
Pr0.01	Control mode	1	0 ~ 2	0	--	Power off valid
Pr0.02	Real-time auto-gain tuning mo..	2	0 ~ 2	0	--	No
Pr0.03	Real-time auto-gain tuning stiff..	16	0 ~ 31	11	--	No
Pr0.04	Ratio of inertia	250	0 ~ 10000	250	%	No
Pr0.06	Command pulse poler setup	0	0 ~ 1	0	--	Power off valid
Pr0.07	Command pulse input mode s..	3	0 ~ 3	3	--	Power off valid
Pr0.08	Command pulse counts per o..	0	0 ~ 32767	0	Pulse	Power off valid
Pr0.09	1st numerator of electronic gear	1	1 ~ 32767	1	--	No
Pr0.10	Denominator of electronic gear	1	1 ~ 32767	1	--	No
Pr0.11	Output pulse counts per one m..	2500	1 ~ 2500	2500	P/rev	Power off valid
Pr0.12	Pulse output logic reverse	0	0 ~ 1	0	--	Power off valid
Pr0.13	1st torque limit	300	0 ~ 500	300	--	No
Pr0.14	Position deviation setup	200	0 ~ 500	200	0.1rev	Encoder unit
Pr0.16	Extenal regenerative resistor ..	50	10 ~ 500	50	Ω	Power off valid
Pr0.17	Regeneration discharge resis..	50	10 ~ 5000	50	W	Power off valid
Pr0.18	Vibration suppression - N after..	10	0 ~ 1000	10	Pulse	Encoder unit
Pr0.19	Vibration suppression - S after..	10	0 ~ 1000	10	Pulse	Encoder unit

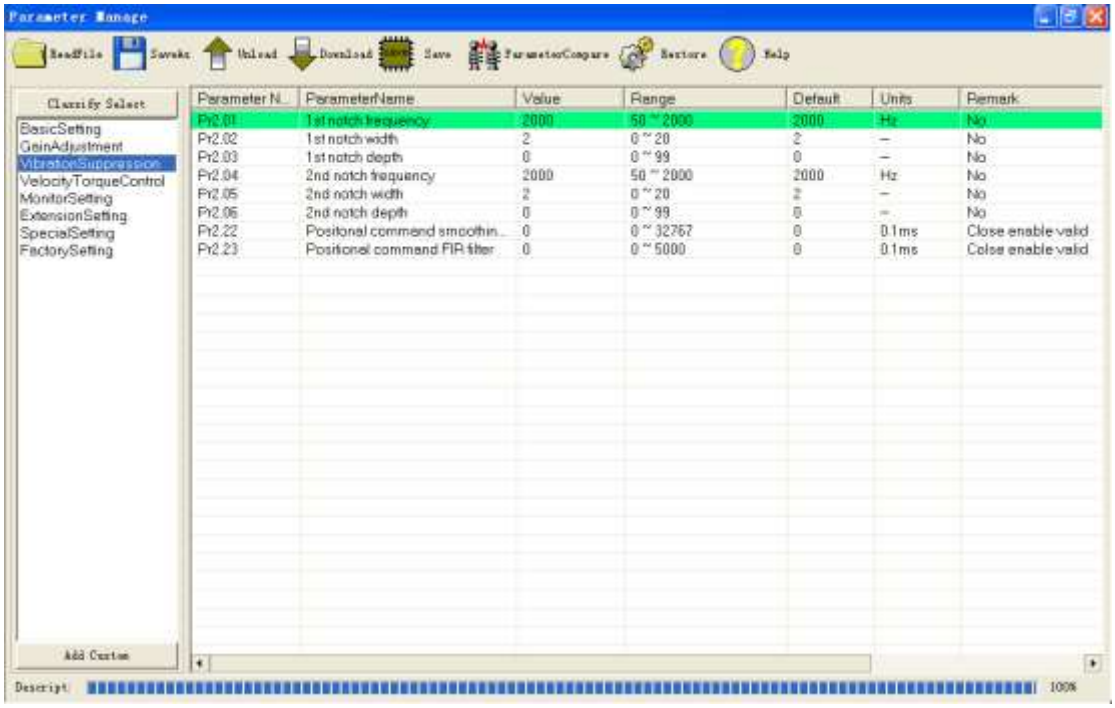
In this parameter window, you can set many parameters, the most basic parameter setting is control mode setting, then is the other parameter setting according to your system state.

Gain adjust



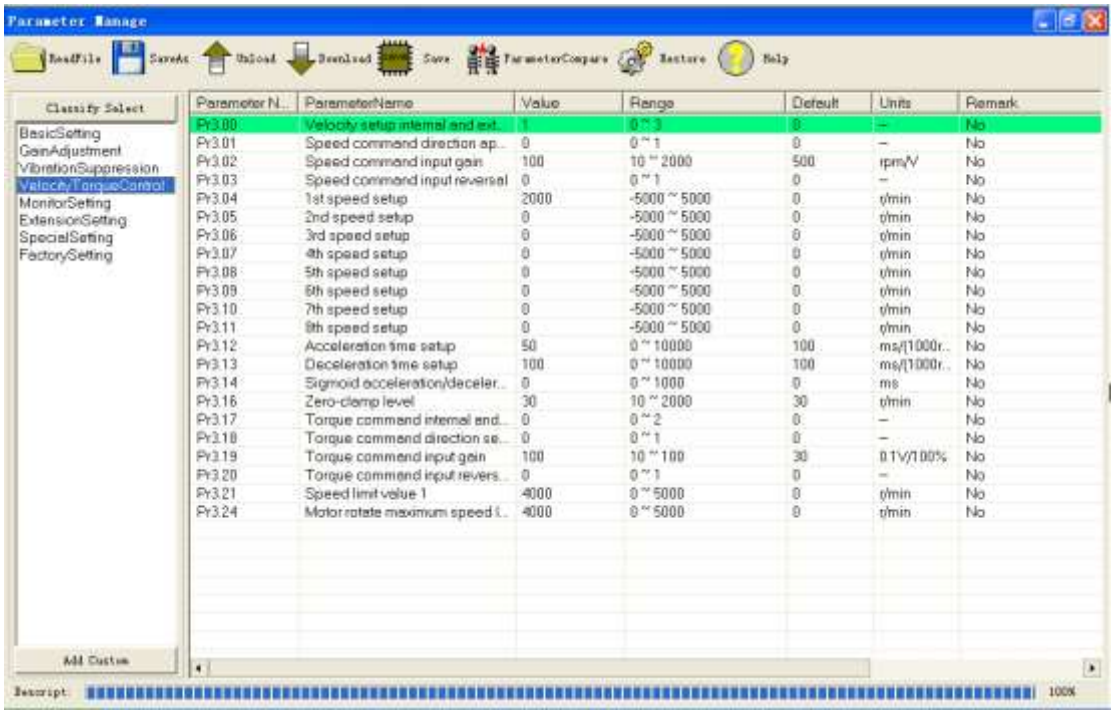
In this parameter window, main setup position loop parameter and velocity loop parameter

Vibration suppression



In this parameter window, main setup filter parameter, if during debug gain have disturbance, it will need to tuning filter parameter.

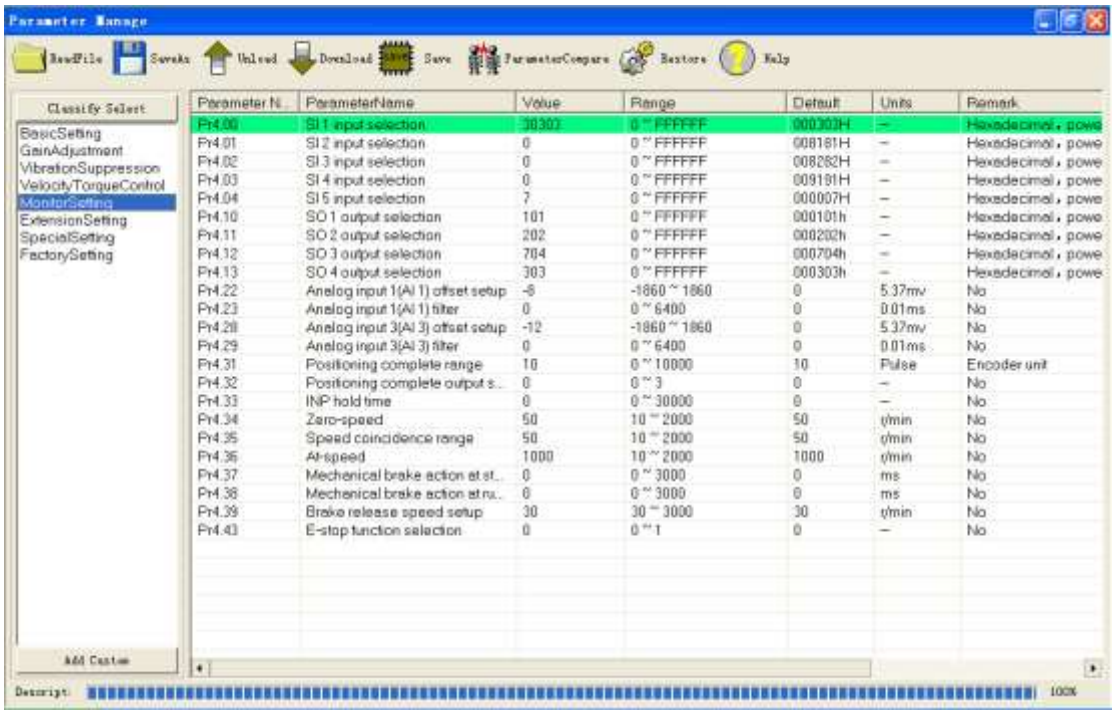
Velocity torque control



Parameter N...	ParameterName	Value	Range	Default	Units	Remark
Pr3.00	Velocity setup internal and ext...	1	0 ~ 3	0	–	No
Pr3.01	Speed command direction ap...	0	0 ~ 1	0	–	No
Pr3.02	Speed command input gain	100	10 ~ 2000	500	rpm/V	No
Pr3.03	Speed command input reversal	0	0 ~ 1	0	–	No
Pr3.04	1st speed setup	2000	-5000 ~ 5000	0	r/min	No
Pr3.05	2nd speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.06	3rd speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.07	4th speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.08	5th speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.09	6th speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.10	7th speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.11	8th speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.12	Acceleration time setup	50	0 ~ 10000	100	ms/(1000r...	No
Pr3.13	Deceleration time setup	100	0 ~ 10000	100	ms/(1000r...	No
Pr3.14	Sigmoid acceleration/deceler...	0	0 ~ 1000	0	ms	No
Pr3.16	Zero-clamp level	30	10 ~ 2000	30	r/min	No
Pr3.17	Torque command internal and...	0	0 ~ 2	0	–	No
Pr3.18	Torque command direction se...	0	0 ~ 1	0	–	No
Pr3.19	Torque command input gain	100	10 ~ 100	30	0.1V/100%	No
Pr3.20	Torque command input revers...	0	0 ~ 1	0	–	No
Pr3.21	Speed limit value 1	4000	0 ~ 5000	0	r/min	No
Pr3.24	Motor rotate maximum speed (...	4000	0 ~ 5000	0	r/min	No

In this parameter window,you can setup velocity and torque related parameter.

Monitor setup

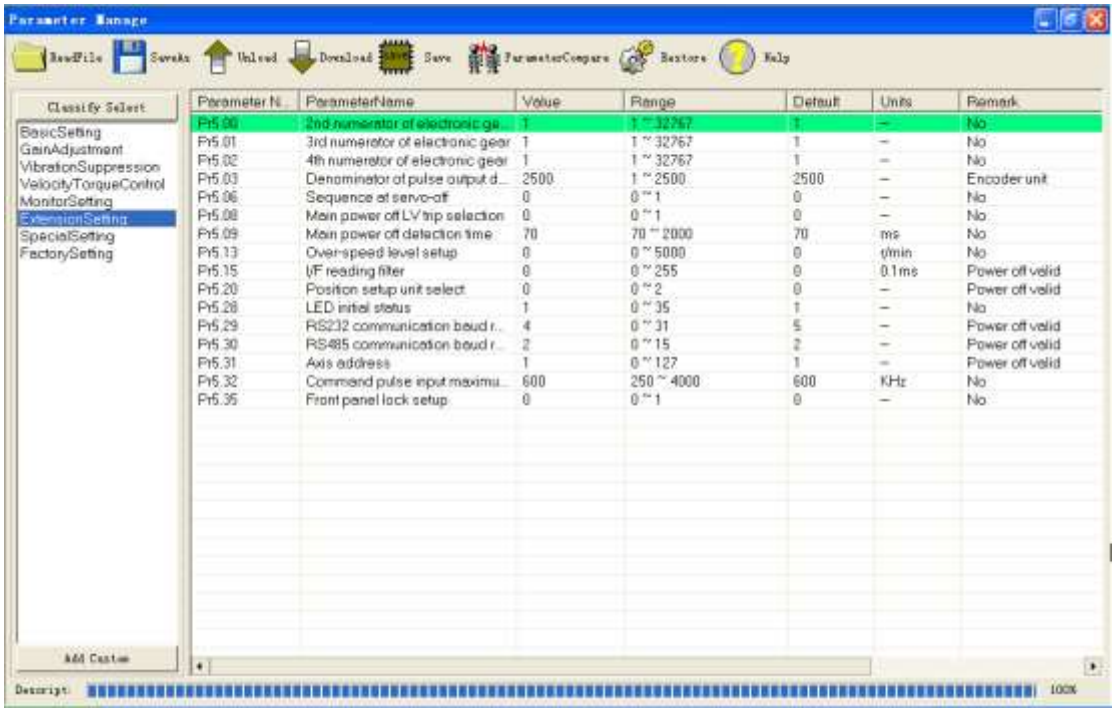


Parameter N...	ParameterName	Value	Range	Default	Units	Remark
Pr4.00	SI 1 input selection	30303	0 ~ FFFFFF	000303H	–	Hexadecimal, powe
Pr4.01	SI 2 input selection	0	0 ~ FFFFFF	008181H	–	Hexadecimal, powe
Pr4.02	SI 3 input selection	0	0 ~ FFFFFF	008282H	–	Hexadecimal, powe
Pr4.03	SI 4 input selection	0	0 ~ FFFFFF	009191H	–	Hexadecimal, powe
Pr4.04	SI 5 input selection	7	0 ~ FFFFFF	000007H	–	Hexadecimal, powe
Pr4.10	SO 1 output selection	101	0 ~ FFFFFF	000101h	–	Hexadecimal, powe
Pr4.11	SO 2 output selection	202	0 ~ FFFFFF	000202h	–	Hexadecimal, powe
Pr4.12	SO 3 output selection	704	0 ~ FFFFFF	000704h	–	Hexadecimal, powe
Pr4.13	SO 4 output selection	303	0 ~ FFFFFF	000303h	–	Hexadecimal, powe
Pr4.22	Analog input 1(AI 1) offset setup	-6	-1860 ~ 1860	0	5.37mv	No
Pr4.23	Analog input 1(AI 1) filter	0	0 ~ 6400	0	0.01ms	No
Pr4.28	Analog input 3(AI 3) offset setup	-12	-1860 ~ 1860	0	5.37mv	No
Pr4.29	Analog input 3(AI 3) filter	0	0 ~ 6400	0	0.01ms	No
Pr4.31	Positioning complete range	10	0 ~ 10000	10	Pulse	Encoder unit
Pr4.32	Positioning complete output s...	0	0 ~ 3	0	–	No
Pr4.33	INP hold time	0	0 ~ 30000	0	–	No
Pr4.34	Zero-speed	50	10 ~ 2000	50	r/min	No
Pr4.35	Speed coincidence range	50	10 ~ 2000	50	r/min	No
Pr4.36	At-speed	1000	10 ~ 2000	1000	r/min	No
Pr4.37	Mechanical brake action at st...	0	0 ~ 3000	0	ms	No
Pr4.38	Mechanical brake action at ru...	0	0 ~ 3000	0	ms	No
Pr4.39	Brake release speed setup	30	30 ~ 3000	30	r/min	No
Pr4.43	E-stop function selection	0	0 ~ 1	0	–	No

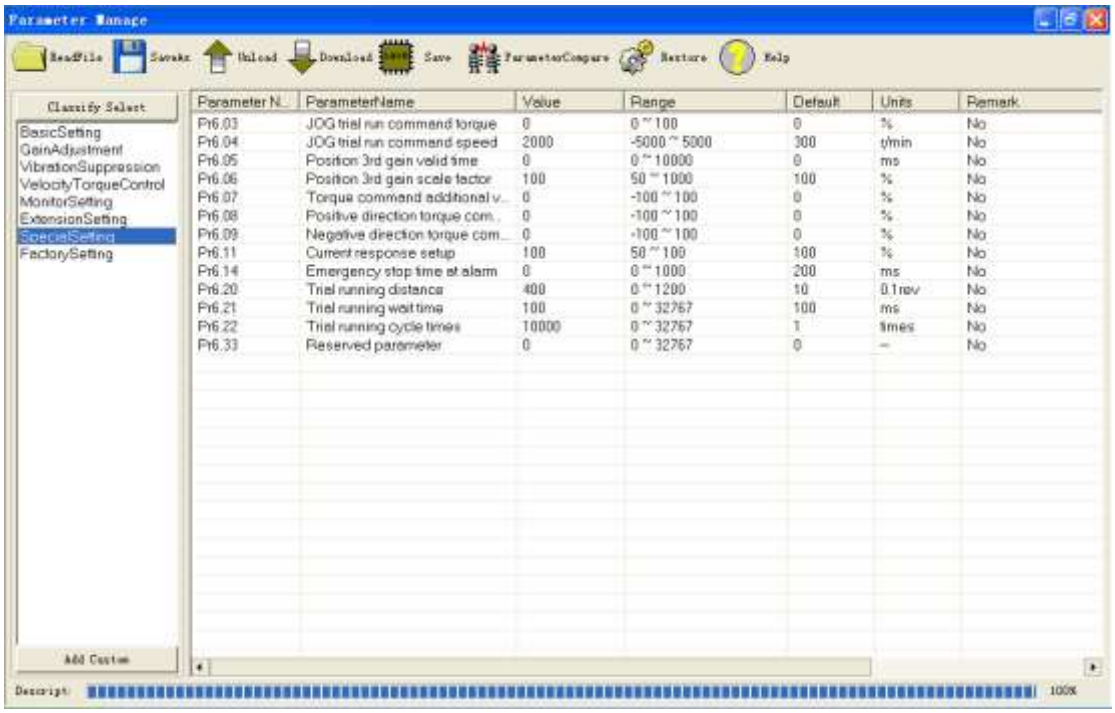
In this parameter window,you can software enable by means of setup SI-1 input select value,you

also can setup analog input related parameter.

Extension setup

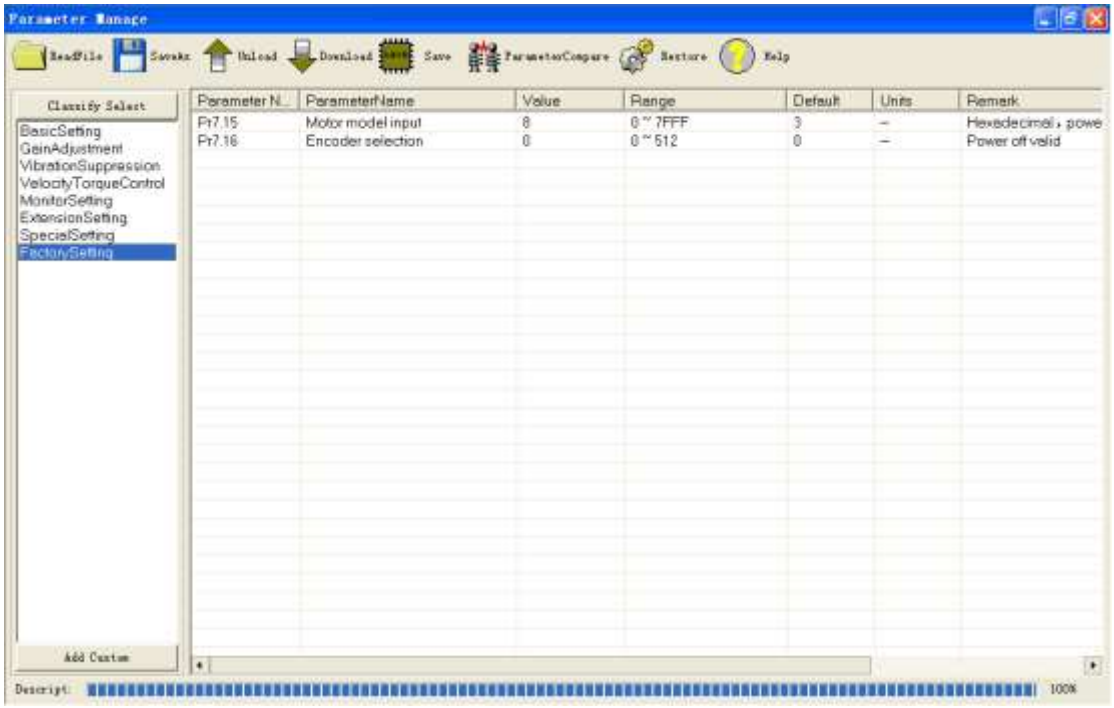


Special setup



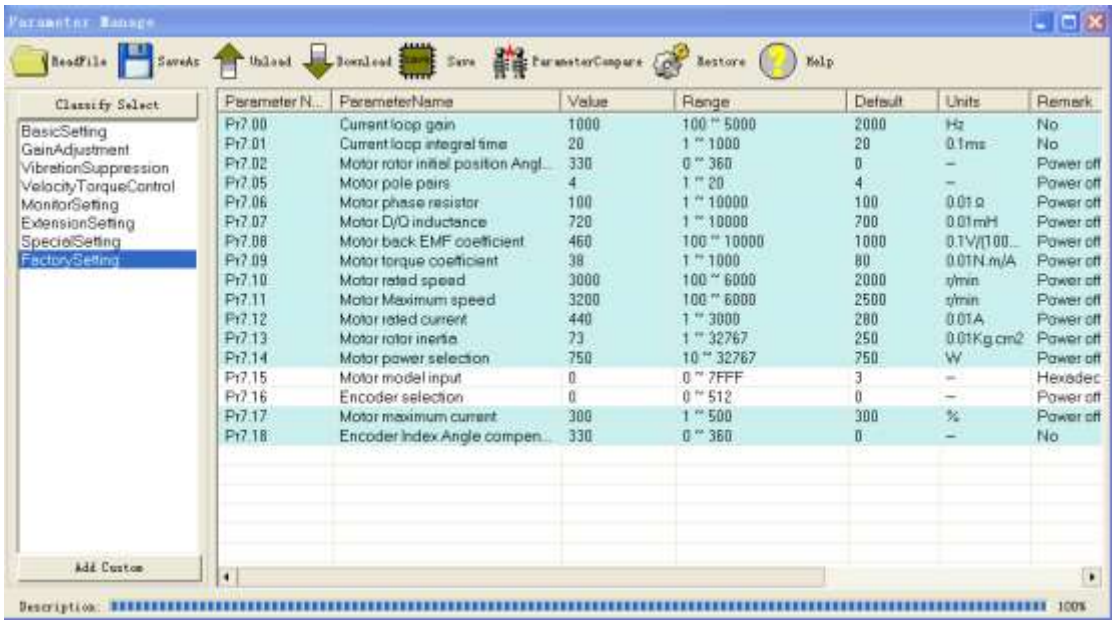
In this parameter window,you can setup run test related parameter.

Factory setup

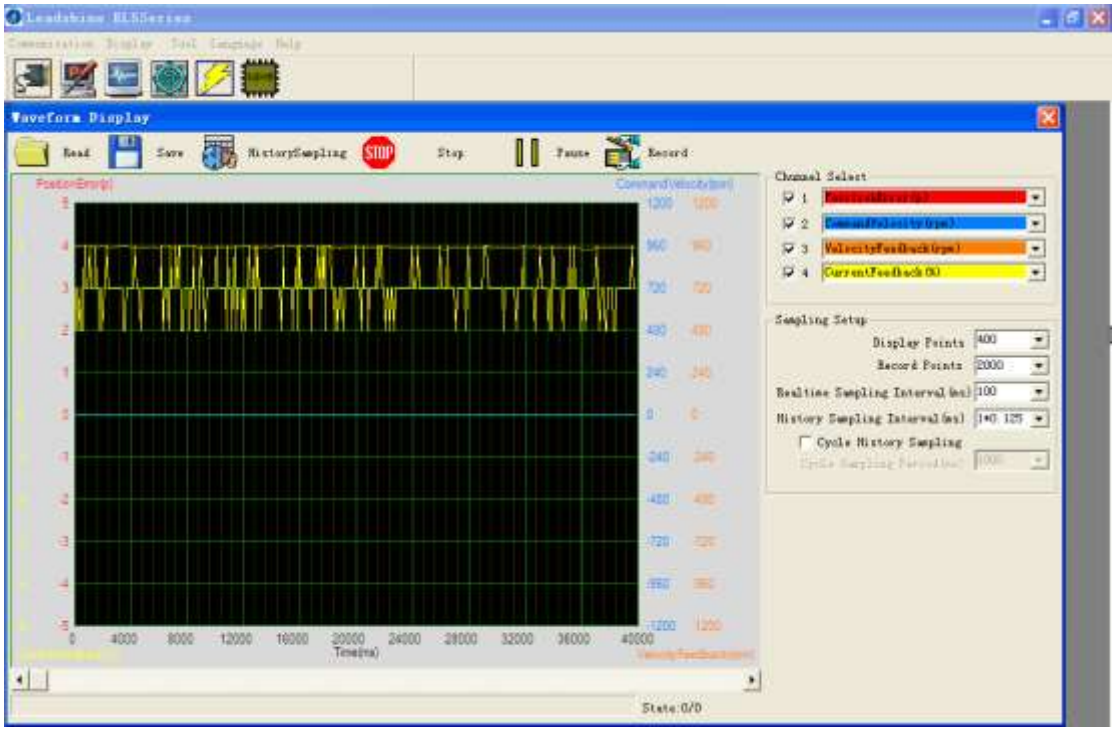


In this parameter window, you can setup related motor parameter. when the motor isn't our company match motor, setup Pr7.15=0,it will appear many related motor parameters, it need you setup each related motor parameter according actual motor state. If the motor is our company match motor, setup Pr7.15 parameter value according to the manufacturer what our company match motor.

This is the other motor parameter setup window.



Waveform Curve



Reading:

Open existing waveform file, so that analysis the data-collection in running

Save:

Make the current record wave save as waveform file. Notice save after recorded in advance.

History sampling:

Acquisition driver running in a little time segment data. Related parameter have history sampling interval, 1*0.125ms indicate each channel 0.125ms collect a data, 10*0.125ms indicate each channel 1.25ms collect a data.

Real-time sampling:

Real-time sampling data, related parameter have real-time sampling interval, 100ms indicate each channel 100ms collect data one time

Stop:

Stop sampling; notice: this operation will clear record sampling data.

Suspend/Continue:

Suspend sampling, it's different from stop, the sampling wave continue after suspend, continue sampling in the last time suspend place.

Sampling points:

The most display sampling data number of a screen a time.

Sampling file long:

The most max sampling number of recording become wave file.2000 indicate, this wave file content 2000 sampling data each channel. It may also only collect 900 or 800 point when selection sampling 2000 point.

Loop history sampling:

Continue reading segment sampling data. Loop sampling period setup the frequency of refresh wave curve. Larger data, the lower frequency. The longer curve delay time

Channel selection:

Selection channel sampling type that you caution.

Magnify/reduce:

Click the left key select magnify area; click left key back the last time magnify area.

The right key menu:

Change background and channel wave color.

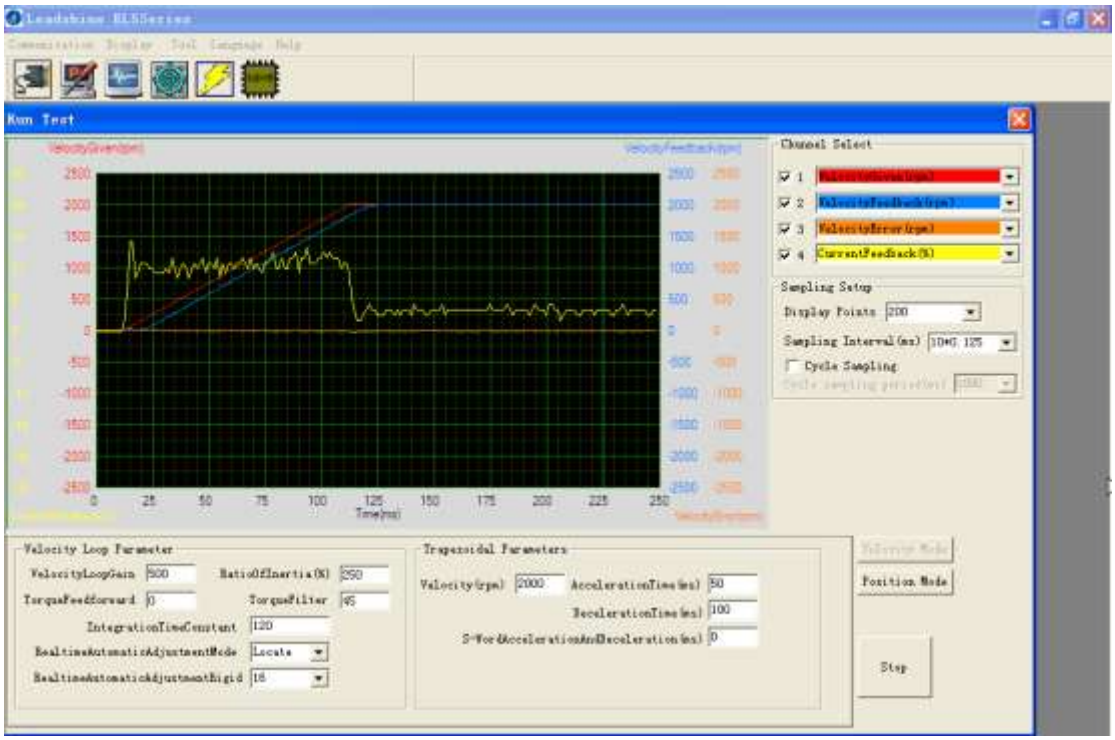
Scroll bar:

The left shift or the right shift check whole wave when load oscillogram exceed a screen display.

Run Test

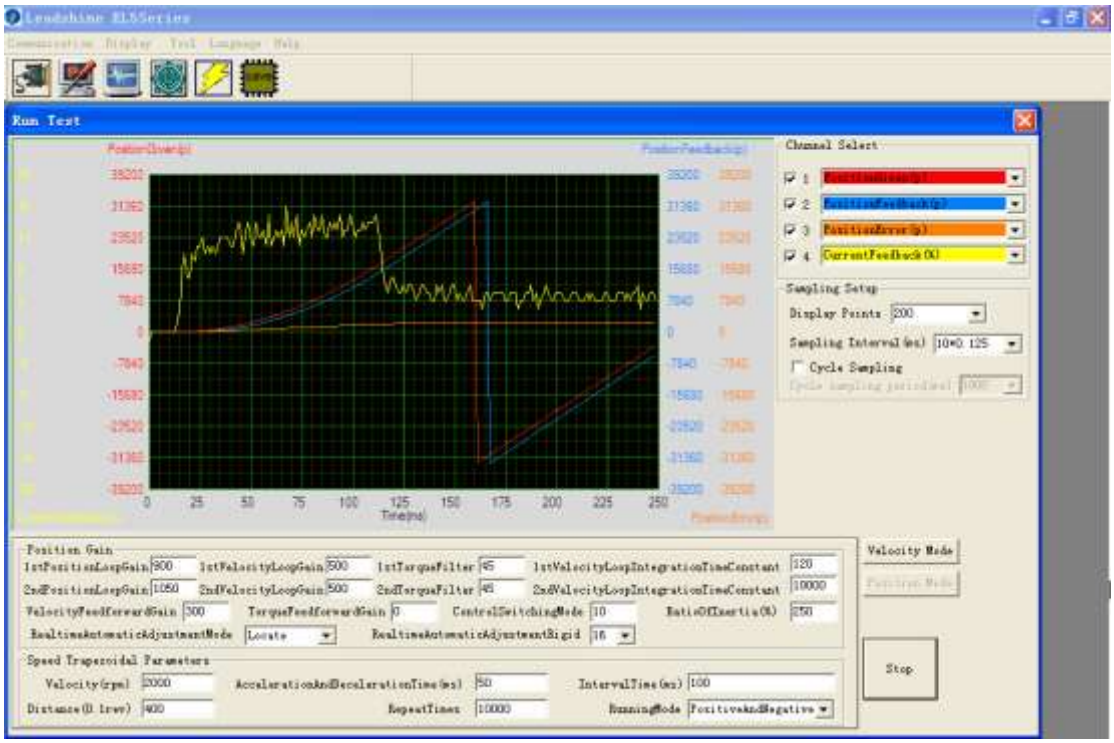
Run Test have two modes, one is velocity mode, the other is position mode. The two mode need to power off restart after switching. The switching mode is effect.

Velocity Mode Tuning Window



Under velocity mode, the parameter what you need to adjust have velocity loop gain, integration time constant, velocity, acceleration, acceleration and deceleration time, etc.

Position Mode Tuning Window



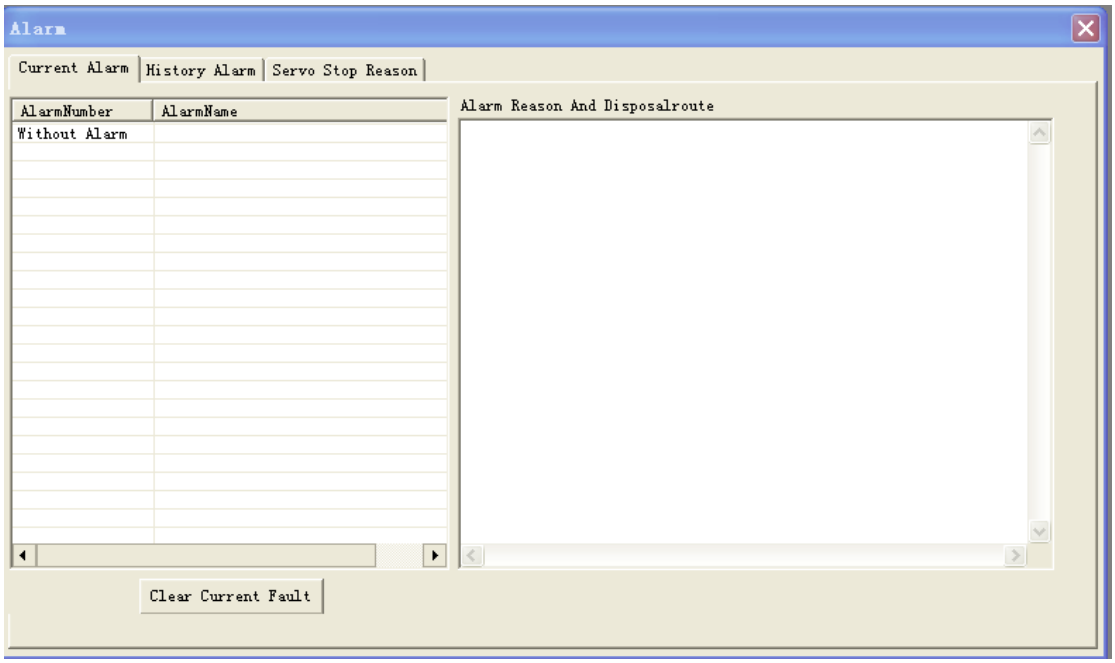
Under position mode, the parameter what you need to adjust is 1st position loop gain, velocity, ratio of inertia, acceleration and deceleration time, etc. you can setup realtime auto adjust mode,

then adjust realtime auto adjust rigid, you may from small to big adjust slowly until motor appear squeal sound, indicate the system stiffness is too big, you need to decrease the rigid.

Alarm

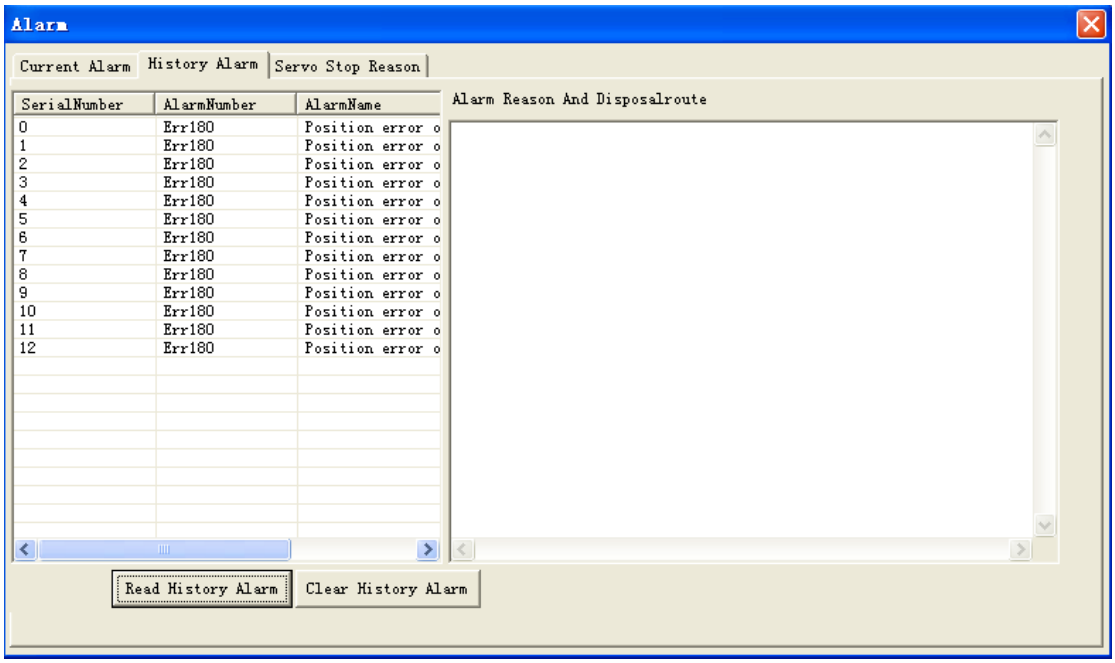
Current alarm

Click alarm name display alarm reason and process method.

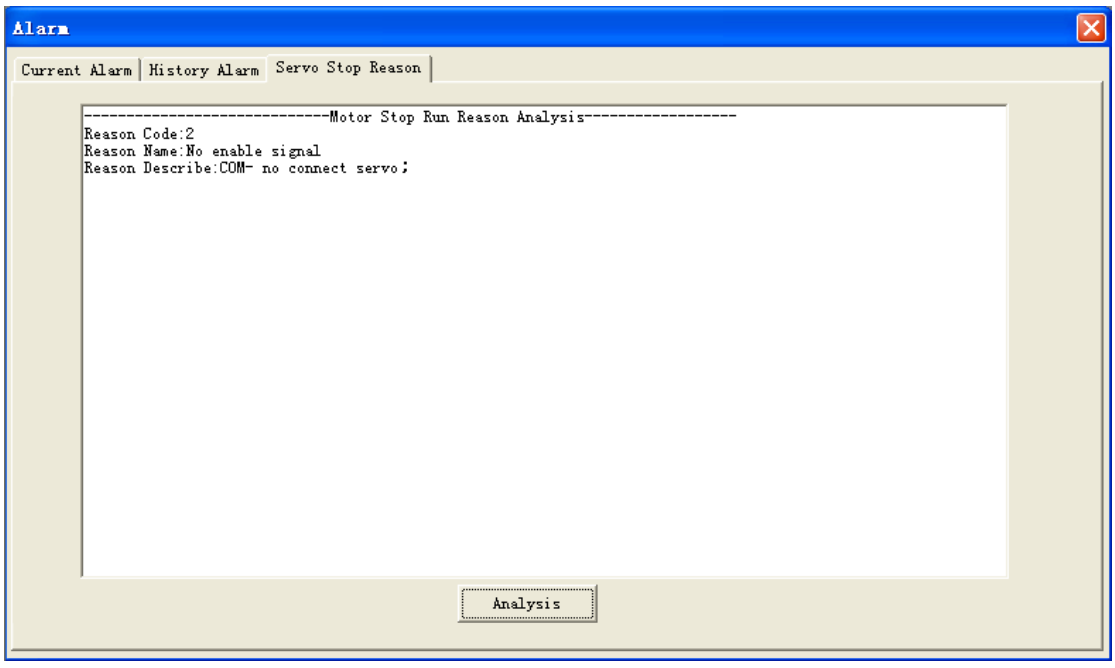


History alarm

The history alarm most can record 13 alarms, Click read history alarm will appear all of history alarm numbers and alarm name because of fault happened in the last. Click alarm name display alarm reason and process method. When the number of alarm exceed 13 alarms, you need to click clear history alarm will clear all of history alarms.



The reasons of servo stop running



Click analysis, the window will appear about the reason of servo no running.

Encoder Manage

In this parameter window, main setup encoder related parameter. If your drive isn't high accuracy encode, you won't see the encode parameter setup window. If your drive is high accuracy encode, you will see the encode parameter setup window.

Reading file:
Reading parameter setup from folder

Save:
Make the current parameter save as parameter file format; and write note so that the other man can clearly know this parameter effect and using range after getting the parameter list

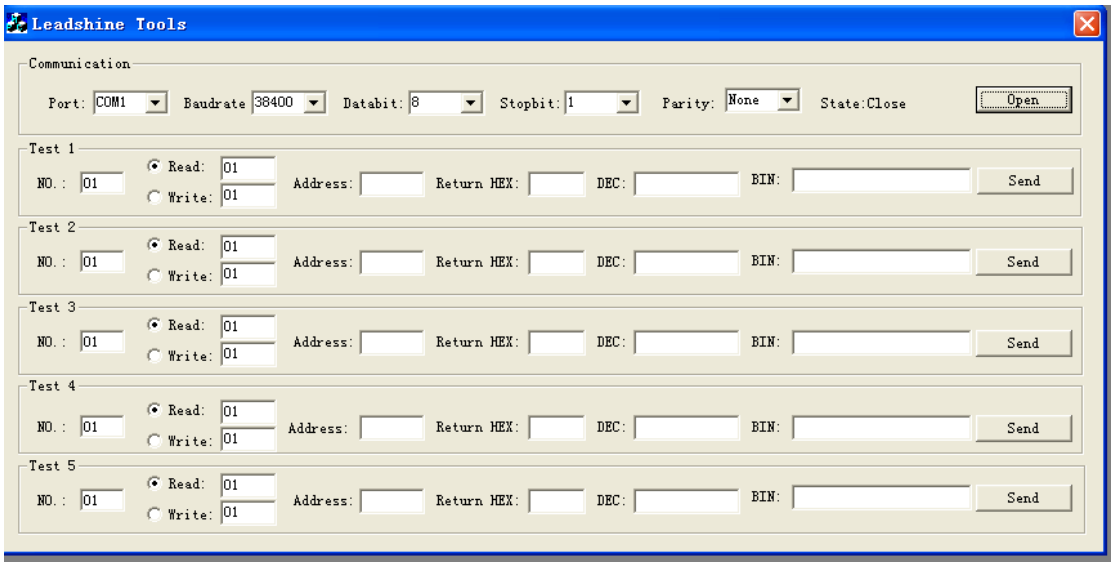
Uploading:
Reading encoder parameter to the computer.

Download:
Make the modification parameter of computer download to the encoder.

Parameter Compare:
Compare the different of two sets parameter and display out.

Tool

Universal tuning software



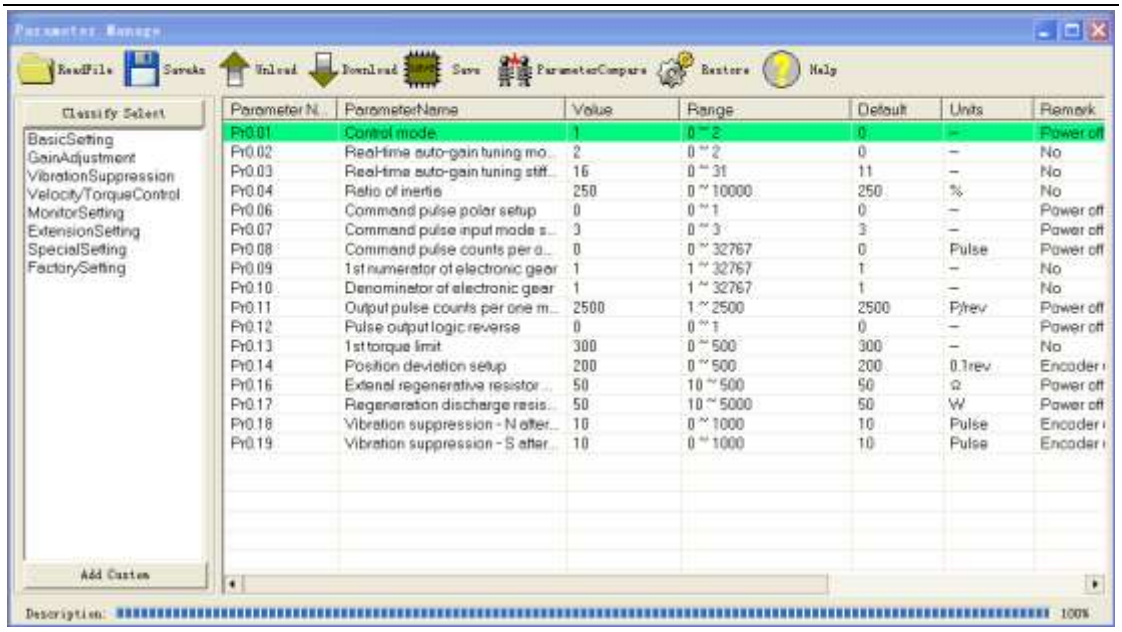
Calculator

Configuring the Drive

Before using the ProTuner software of EL5-D0750 driver, the customer need to select different work mode according to customer mechanical system, different work mode need to different wiring method, please refer to user manual, when driver wiring connecting was finished, you can tune different loop gain parameter in different work mode with ProTuner software.

Torque mode

The torque mode is analog input control mode, via AI3 send ±10V analog input signal, in the torque mode, we can't see waveform curve, but we may setup related parameter with torque mode. In parameter manage window

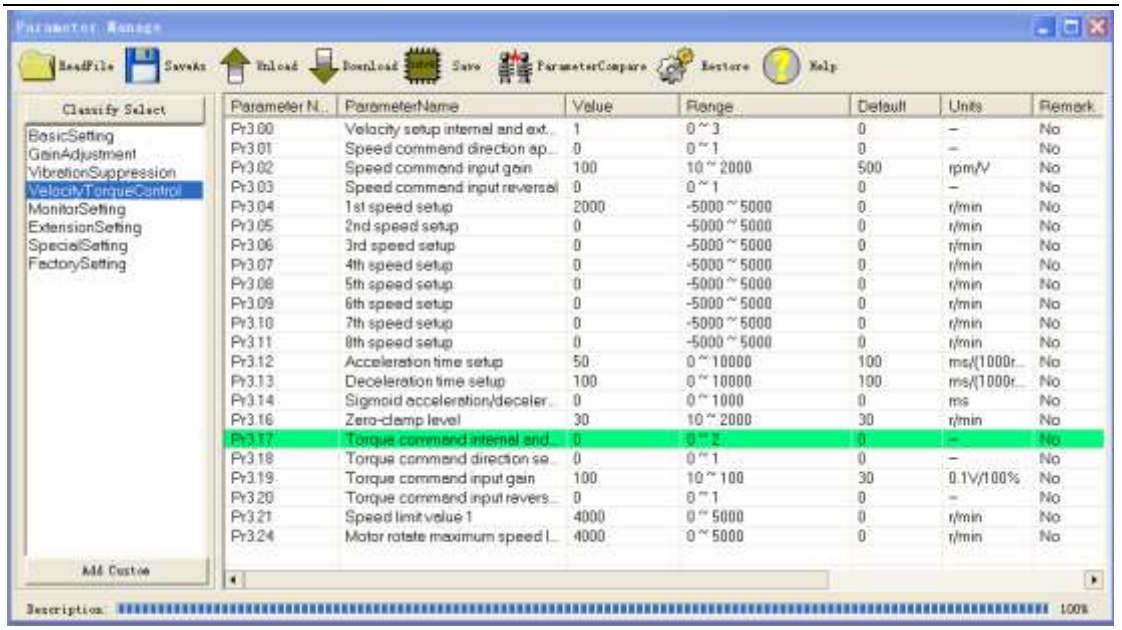


Parameter N...	ParameterName	Value	Range	Default	Units	Remark
Pr0.01	Control mode	1	0 ~ 2	0	–	Power off
Pr0.02	Real-time auto-gain tuning mo...	2	0 ~ 2	0	–	No
Pr0.03	Real-time auto-gain tuning stiff...	16	0 ~ 31	11	–	No
Pr0.04	Ratio of inertia	250	0 ~ 10000	250	%	No
Pr0.06	Command pulse polar setup	0	0 ~ 1	0	–	Power off
Pr0.07	Command pulse input mode s...	3	0 ~ 3	3	–	Power off
Pr0.08	Command pulse counts per o...	0	0 ~ 32767	0	Pulse	Power off
Pr0.09	1st numerator of electronic gear	1	1 ~ 32767	1	–	No
Pr0.10	Denominator of electronic gear	1	1 ~ 32767	1	–	No
Pr0.11	Output pulse counts per one m...	2500	1 ~ 2500	2500	P/rev	Power off
Pr0.12	Pulse output logic reverse	0	0 ~ 1	0	–	Power off
Pr0.13	1st torque limit	300	0 ~ 500	300	–	No
Pr0.14	Position deviation setup	200	0 ~ 500	200	0.1rev	Encoder
Pr0.16	External regenerative resistor ...	50	10 ~ 500	50	Ω	Power off
Pr0.17	Regeneration discharge resis...	50	10 ~ 5000	50	W	Power off
Pr0.18	Vibration suppression - N after...	10	0 ~ 1000	10	Pulse	Encoder
Pr0.19	Vibration suppression - S after...	10	0 ~ 1000	10	Pulse	Encoder

In basic setting parameter, you first setting Pr0.01=2, make the control mode become torque mode, then in monitor setting, you need to setup Pr4.00=30303,make the motor enable

Parameter N...	ParameterName	Value	Range	Default	Units	Remark
Pr4.00	SI 1 input selection	30303	0 ~ FFFFFF	000303H	–	Hexadec
Pr4.01	SI 2 input selection	0	0 ~ FFFFFF	008181H	–	Hexadec
Pr4.02	SI 3 input selection	0	0 ~ FFFFFF	008282H	–	Hexadec
Pr4.03	SI 4 input selection	0	0 ~ FFFFFF	009191H	–	Hexadec
Pr4.04	SI 5 input selection	7	0 ~ FFFFFF	000007H	–	Hexadec
Pr4.10	SO 1 output selection	101	0 ~ FFFFFF	000101h	–	Hexadec
Pr4.11	SO 2 output selection	202	0 ~ FFFFFF	000202h	–	Hexadec
Pr4.12	SO 3 output selection	704	0 ~ FFFFFF	000704h	–	Hexadec
Pr4.13	SO 4 output selection	303	0 ~ FFFFFF	000303h	–	Hexadec
Pr4.22	Analog input 1(AI 1) offset setup	-8	-1860 ~ 1860	0	5.37mv	No
Pr4.23	Analog input 1(AI 1) filter	0	0 ~ 6400	0	0.01ms	No
Pr4.28	Analog input 3(AI 3) offset setup	-12	-1860 ~ 1860	0	5.37mv	No
Pr4.29	Analog input 3(AI 3) filter	0	0 ~ 6400	0	0.01ms	No
Pr4.31	Positioning complete range	10	0 ~ 10000	10	Pulse	Encoder
Pr4.32	Positioning complete output s...	0	0 ~ 3	0	–	No
Pr4.33	INP hold time	0	0 ~ 30000	0	–	No
Pr4.34	Zero-speed	50	10 ~ 2000	50	r/min	No
Pr4.35	Speed coincidence range	50	10 ~ 2000	50	r/min	No
Pr4.36	At-speed	1000	10 ~ 2000	1000	r/min	No
Pr4.37	Mechanical brake action at st...	0	0 ~ 3000	0	ms	No
Pr4.38	Mechanical brake action at ru...	0	0 ~ 3000	0	ms	No
Pr4.39	Brake release speed setup	30	30 ~ 3000	30	r/min	No
Pr4.43	E-stop function selection	0	0 ~ 1	0	–	No

The last you need to in velocity torque control parameter setup Pr3.17=0,pr3.19,pr3.21,pr3.24



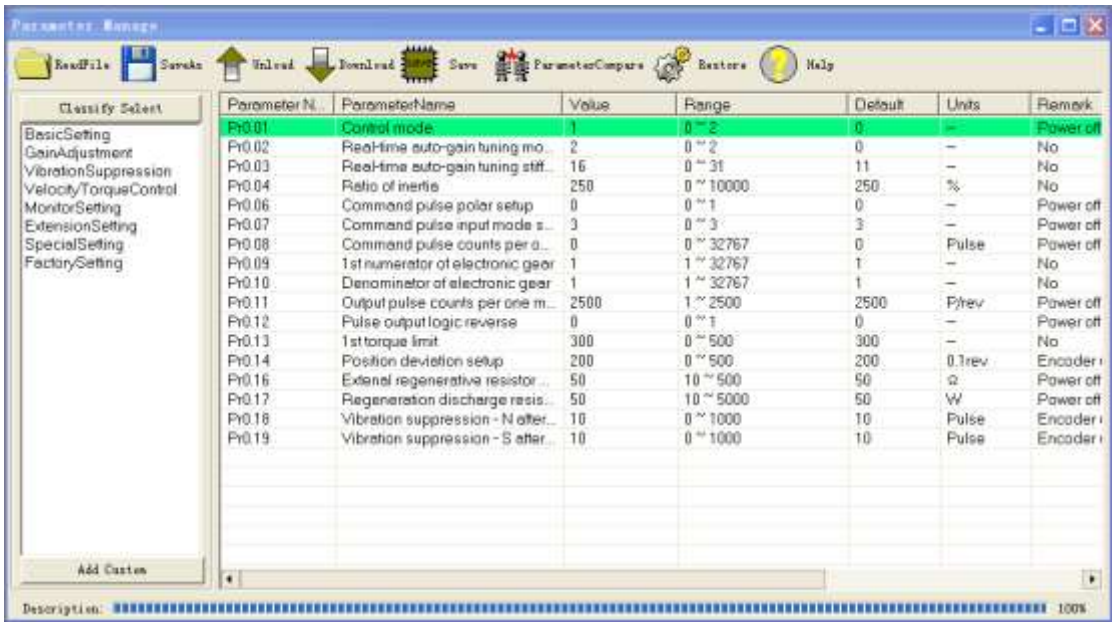
Parameter N..	ParameterName	Value	Range	Default	Units	Remark
Pr3.00	Velocity setup internal and ext..	1	0 ~ 3	0	–	No
Pr3.01	Speed command direction ap..	0	0 ~ 1	0	–	No
Pr3.02	Speed command input gain	100	10 ~ 2000	500	rpm/V	No
Pr3.03	Speed command input reversal	0	0 ~ 1	0	–	No
Pr3.04	1st speed setup	2000	-5000 ~ 5000	0	r/min	No
Pr3.05	2nd speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.06	3rd speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.07	4th speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.08	5th speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.09	6th speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.10	7th speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.11	8th speed setup	0	-5000 ~ 5000	0	r/min	No
Pr3.12	Acceleration time setup	50	0 ~ 10000	100	ms/(1000r..	No
Pr3.13	Deceleration time setup	100	0 ~ 10000	100	ms/(1000r..	No
Pr3.14	Sigmoid acceleration/deceler..	0	0 ~ 1000	0	ms	No
Pr3.16	Zero-clamp level	30	10 ~ 2000	30	r/min	No
Pr3.17	Torque command internal and..	0	0 ~ 2	0	–	No
Pr3.18	Torque command direction se..	0	0 ~ 1	0	–	No
Pr3.19	Torque command input gain	100	10 ~ 100	30	0.1V/100%	No
Pr3.20	Torque command input revers..	0	0 ~ 1	0	–	No
Pr3.21	Speed limit value 1	4000	0 ~ 5000	0	r/min	No
Pr3.24	Motor rotate maximum speed l..	4000	0 ~ 5000	0	r/min	No

When you have finished the above all of these parameters setting, you can send analog signal to drive by CN1 port. The motor will work in torque mode, if you dissatisfied to parameter setting, you may continue adjust related torque parameter.

Velocity mode

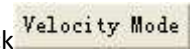
Velocity Loop Tuning

The first you need to modify the parameter value of control mode in the parameter manage window, make the parameter value of control mode become to 1.

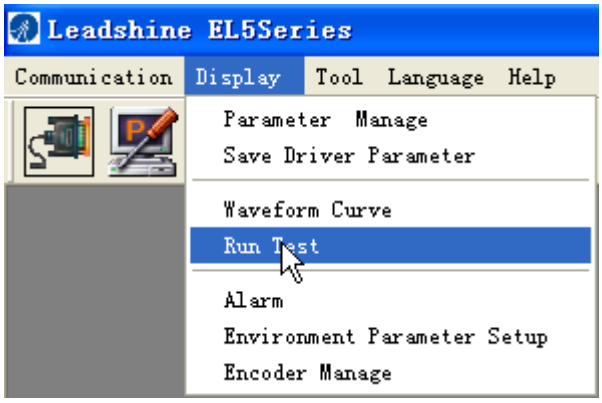


Parameter N..	ParameterName	Value	Range	Default	Units	Remark
Pr0.01	Control mode	1	0 ~ 2	0	–	Power off
Pr0.02	Real-time auto-gain tuning mo..	2	0 ~ 2	0	–	No
Pr0.03	Real-time auto-gain tuning stiff..	16	0 ~ 31	11	–	No
Pr0.04	Ratio of inertia	250	0 ~ 10000	250	%	No
Pr0.06	Command pulse polar setup	0	0 ~ 1	0	–	Power off
Pr0.07	Command pulse input mode s..	3	0 ~ 3	3	–	Power off
Pr0.08	Command pulse counts per o..	0	0 ~ 32767	0	Pulse	Power off
Pr0.09	1st numerator of electronic gear	1	1 ~ 32767	1	–	No
Pr0.10	Denominator of electronic gear	1	1 ~ 32767	1	–	No
Pr0.11	Output pulse counts per one m..	2500	1 ~ 2500	2500	P/rev	Power off
Pr0.12	Pulse output logic reverse	0	0 ~ 1	0	–	Power off
Pr0.13	1st torque limit	300	0 ~ 500	300	–	No
Pr0.14	Position deviation setup	200	0 ~ 500	200	0.1rev	Encoder
Pr0.16	External regenerative resistor..	50	10 ~ 500	50	Ω	Power off
Pr0.17	Regeneration discharge resis..	50	10 ~ 5000	50	W	Power off
Pr0.18	Vibration suppression - N after..	10	0 ~ 1000	10	Pulse	Encoder
Pr0.19	Vibration suppression - S after..	10	0 ~ 1000	10	Pulse	Encoder

Click->Display will appear pull down menu, select Run test, the left key click Run test will appear

velocity mode window, you can also directly click Toolbar button will appear velocity mode window, if you doesn't modify the parameter value of control mode, you can also click 

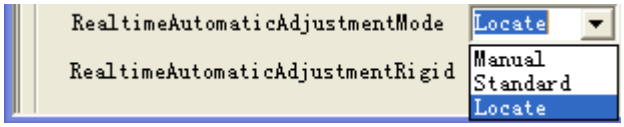
switching to velocity mode window.



Tuning the Velocity Loop Parameters

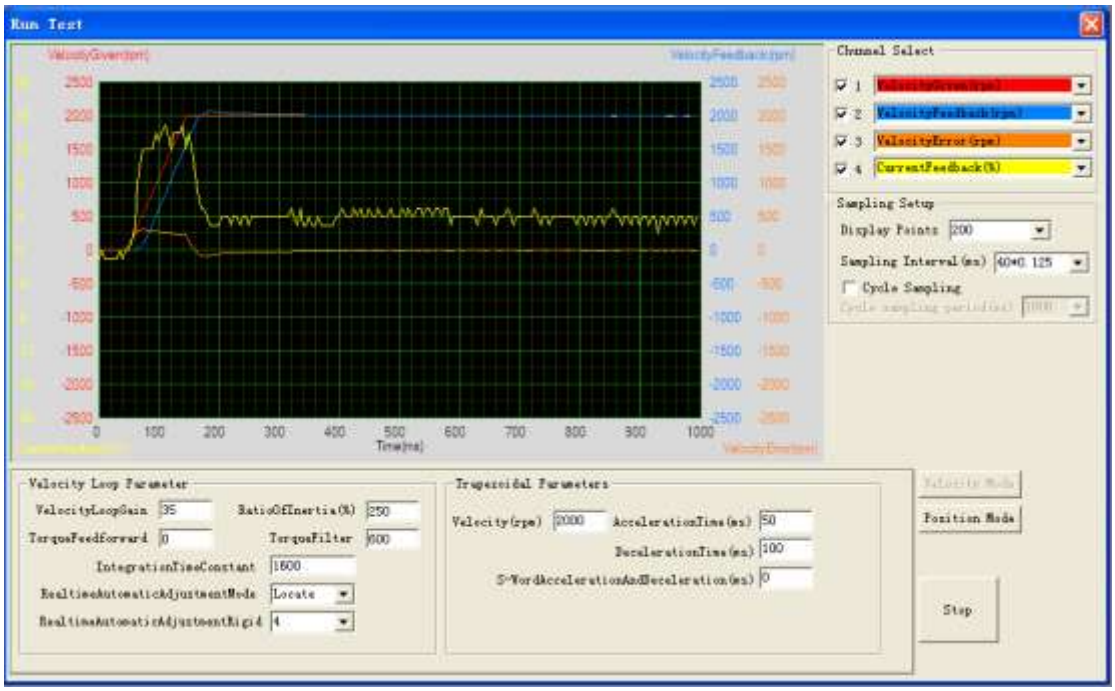
You can select different operation mode in realtime automatic adjustment mode, generally select **Locate** mode, if you want to adjust gain parameter by yourself, you may select **Manual** mode, then you can adjust related parameter step by step until reached system require.

Velocity loop tuning main adjust velocity loop gain, integration time constant, and ratio of inertia, if you need constant speed, you only need adjust ratio of inertia, then adjust gain and integration

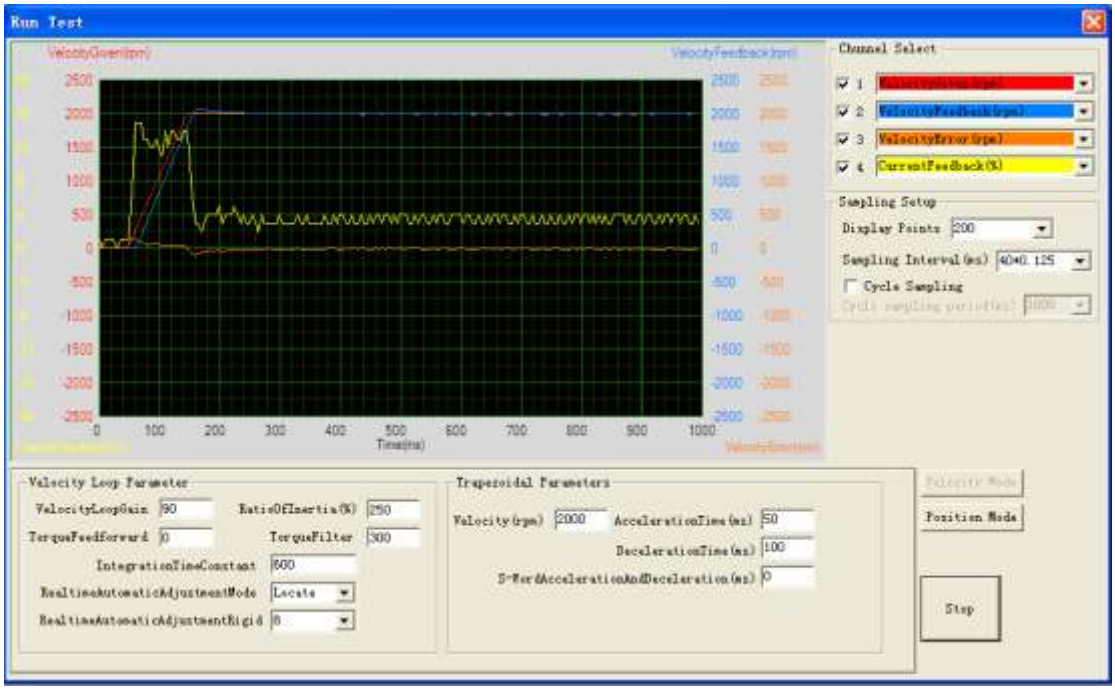


In the **Manual** mode, you can setup VP, VI, V etc related parameter. during tuning velocity loop, you may adjust VI to a very small value in advance and hold it constant, then you can adjustment the value of VP parameter continues increase until system appear oscillation, at this moment you can adjust the value of VI parameter, increase slowly until system appear oscillation, at this moment the system basically adjust finished.

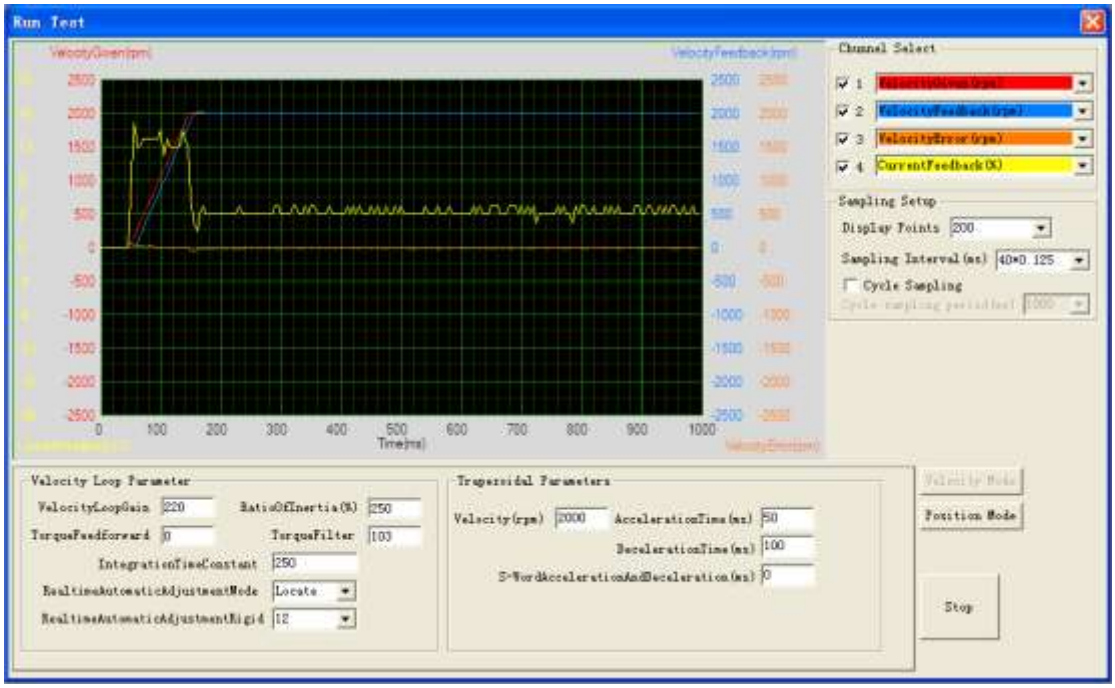
We looked that the effect of tuning in **Locate** mode. we may select a value of realtime automatic adjustment rigid, the first we select a smaller value, then we click the start button.

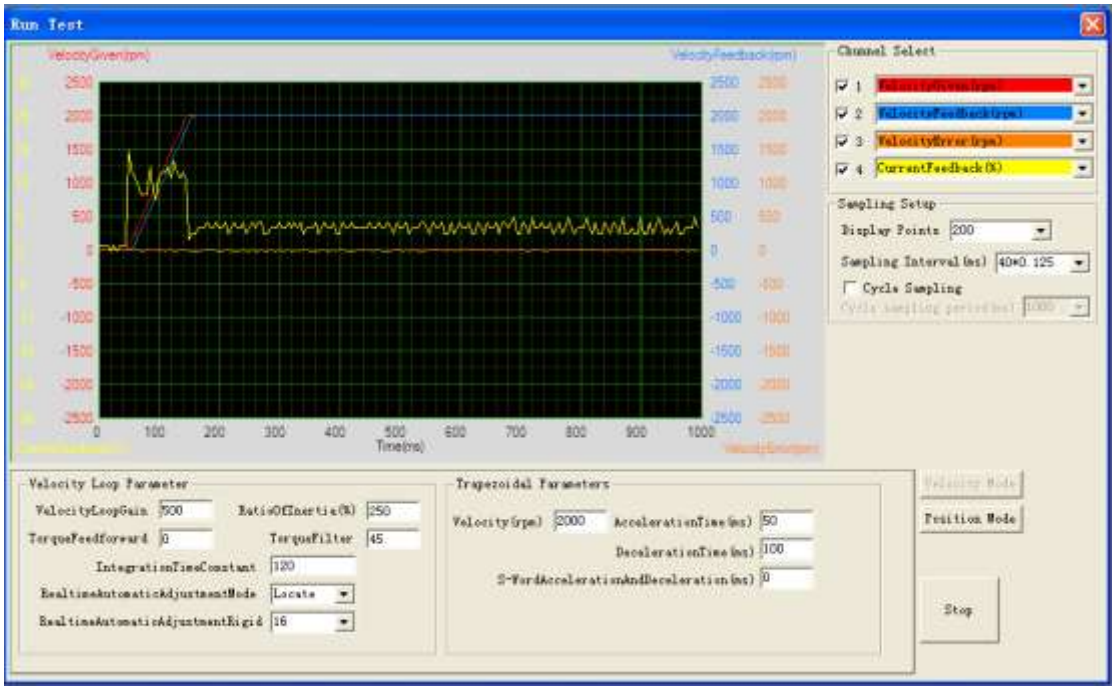


Then we continue increase system rigid, we looked that the velocity error become smaller and smaller.



We continue increase the rigid of system, we looked that the velocity loop gain Vp become bigger and bigger, the integration time constant Vi become smaller and smaller, the velocity error become close to zero.



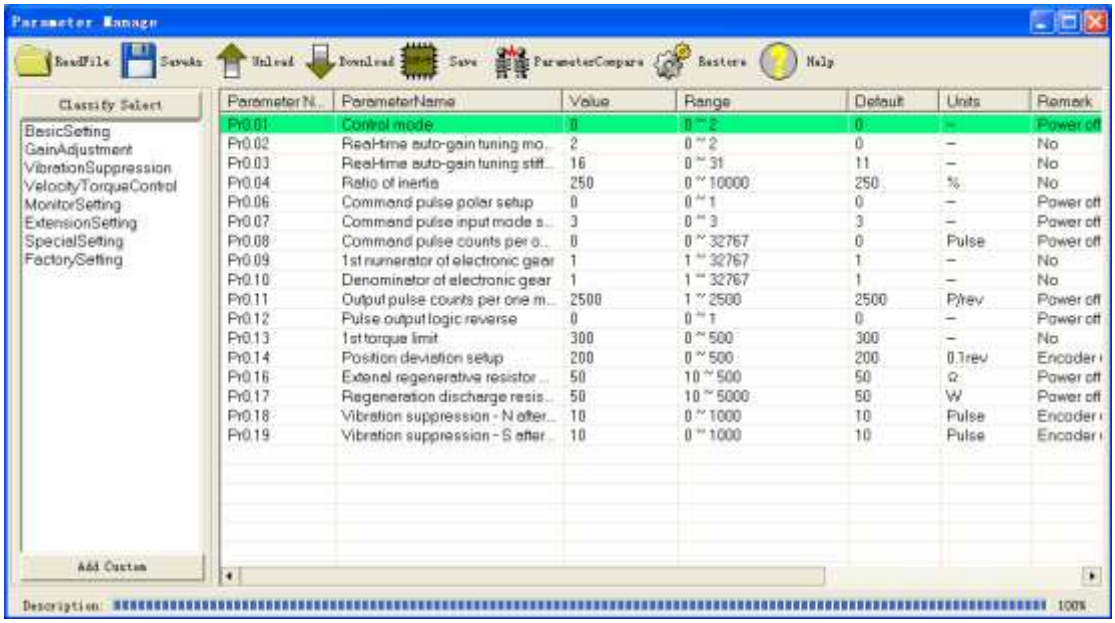


At this moment, the velocity mode of system basically adjust finished.

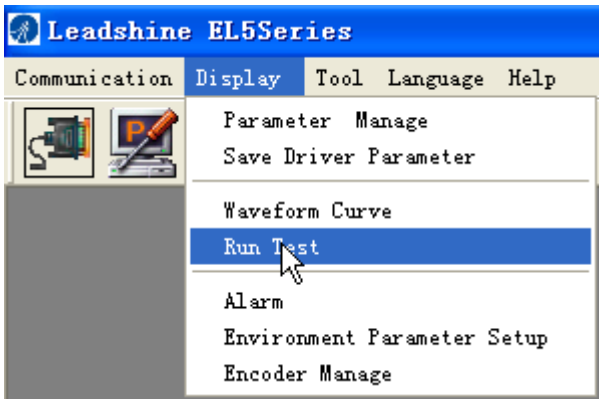
Position mode

Position Loop Tuning

The first you need to modify the parameter value of control mode in the parameter manage window, make the parameter value of control mode become to 0.



Click->Display will appear pull down menu, select Run test, the left key click Run test will appear position mode window, you can also directly click Toolbar button will appear position mode window, if you doesn't modify the parameter value of control mode, you can also click Position Mode switching to velocity mode window.

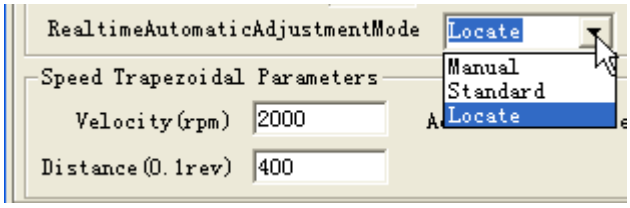


Tuning the Position Loop Parameters

You can select different operation mode in realtime automatic adjustment mode, generally select **Locate** mode, if you want to adjust gain parameter by yourself, you may select **Manual** mode, then you can adjust related parameter step by step until reached system require.

Position loop tuning main adjust position loop gain, velocity integration time constant, and ratio

of inertia, if you need better rigid, you only need adjust ratio of inertia, then adjust gain and integration

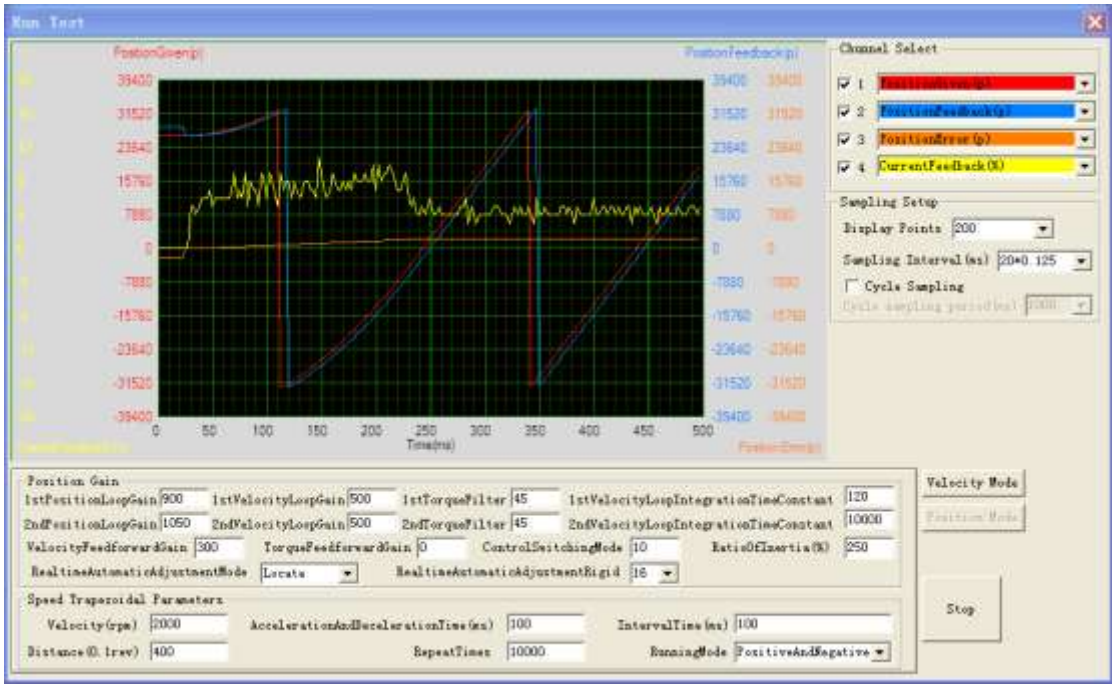


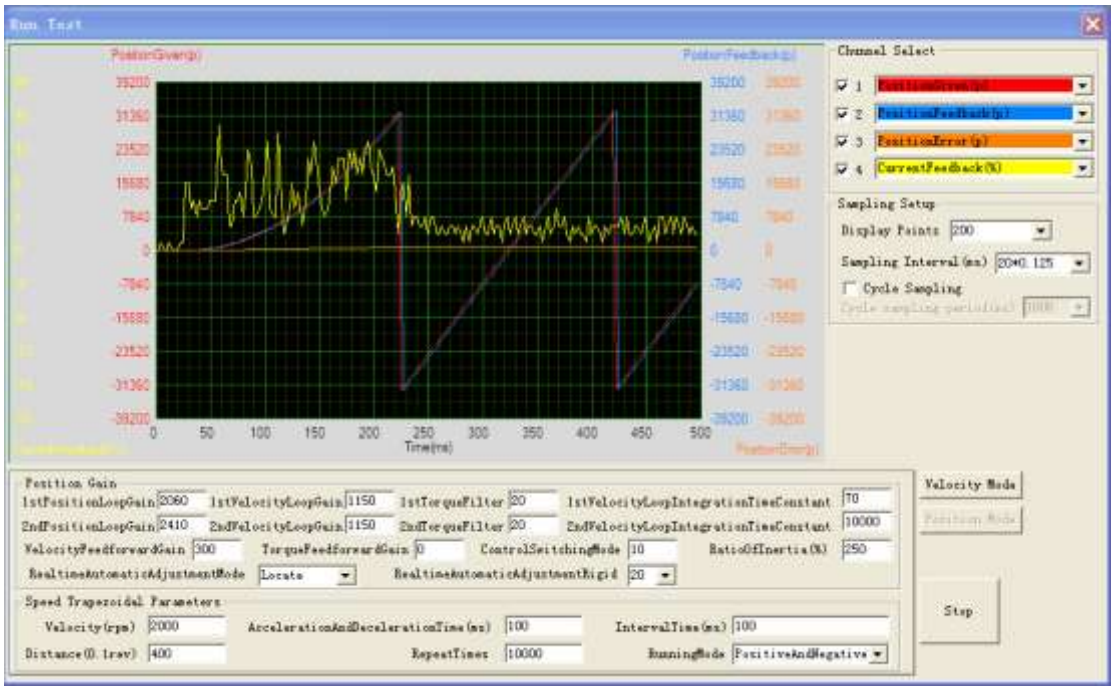
In the **Manual** mode, you can setup KP, VI, V etc related parameter. during tuning position loop, you may adjust KI to a very small value in advance and hold it constant, then you can adjustment the value of KP parameter continues increase until system appear oscillation, at this moment you can adjust the value of VI parameter, increase slowly until system appear oscillation, at this moment the system basically adjust finished.

We looked that the effect of tuning in **Locate** mode. We may select a value of realtime automatic adjustment rigid, the first we select a smaller value, then we click the start button.

Then we continue increase system rigid, we looked that the position error become smaller and smaller.

We continue increase the rigid of system, we looked that the position loop gain Kp become bigger and bigger, the integration time constant Vi become smaller and smaller, the position error become close to zero.





At this moment, the position mode of system basically adjust finished.

When position loop gain continue increase in speed hold constant, we may see that the position error is close to zero. In this moment, the system positioning is very accurate.

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